

### **REMARKS**

Claims 1, 4-9, 11-15 and 17-22 are pending in this application. Claims 1 and 8 have been amended. Claims 2, 3, 10 and 16 have been canceled without any prejudice or disclaimer to the subject matter expressed therein.

Claim 1 has been amended to recite “A method for combining a first material and a second material, comprising the steps of: (a) providing a first material, the first material being a functional material able to alter the function of a second material; (b) providing a fluid which is near or in the supercritical fluid state, (c) at least partially dissolving the functional material in the fluid, (d) providing a second material, the second material being a bulk material; (e) only subsequently incorporating the solution of the functional material and the fluid into the bulk material to form a single phase solution from the functional material, the bulk material and said fluid, and (f) removing said fluid from said solution in order to leave the combined functional and bulk materials, thereby resulting in a material having the function of the functional material.” Support for the amendment of claim 1 can be found throughout the present specification as originally filed.

Claim 8 was amended to recite “A method as claimed in claim 1, wherein the material of step (f) is processed in order to produce a final product.” Support for the amendment to claim 8 can be found throughout the present specification as originally filed.

The amendments and the cancellation of the claims are solely for advancing prosecution. Applicants, by amending or cancelling any claims herein, make no admission as to the validity of any rejection made by the Examiner against any of these

claims. Applicants reserve the right to reassert the original claim scope of any claim amended herein, in a continuing application.

No new matter has been introduced to this application within the meaning of 35 USC §132.

In view of the following, further and favorable consideration is respectfully requested.

- I. At page 2 of the Official Action, claims 1, 4, 7-15 and 17-22 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Starke et al. (U.S. Patent No. 5,816,700) in view of Prince et al. (U.S. Patent No. 5,308,648) and Hoy et al. (U.S. Patent No. 5,108,799)***

As the basis for this rejection, the Official Action states in relevant part:

In summary, it would have been obvious to one of ordinary skill in the coatings manufacturing and applying arts, to have operated the Starke *et al.* system using parameters (pressures, temperatures, flow-rates, choice of solvents, etc.) in such manner to form a single-phase solution and then later release/removal of fluid(s) including supercritical carbon dioxide, as taught by Hoy *et al.* and Prince *et al.*, in order to form a continuously, uniform coating material allowing it to be evenly and uniformly applied to desired substrate or end use.

In view of the following, this rejection is respectfully traversed.

To establish a *prima facie* case of obviousness, the PTO must satisfy three requirements. First, as the U.S. Supreme Court held in *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398 (2007), "a court must ask whether the improvement is more than the predictable use of prior art elements according to their established functions. ...it [may] be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace;

and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. ...it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does... because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known." (KSR, 550 U.S. 398 at 417.) Second, the proposed modification of the prior art must have had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. *Amgen Inc. v. Chugai Pharm. Co.*, 18 USPQ2d 1016, 1023 (Fed. Cir. 1991). Lastly, the prior art references must teach or suggest all the limitations of the claims. *In re Wilson*, 165 USPQ 494, 496 (C.C.P.A. 1970).

Applicants respectfully submit that a *prima facie* case of obviousness has not been established because, whether taken alone or in combination, none of the cited references teach or suggest every element of the presently pending subject matter.

Applicants respectfully direct the Examiner's attention to the scope of amended method claim 1. The claim is drawn to a method for combining a first material and a second material, comprising the steps of: (a) providing a first material, the first material being a functional material able to alter the function of a second material; (b) providing a fluid which is near or in the supercritical fluid state, (c) at least partially dissolving the functional material in the fluid, (d) providing a second material, the second material being a bulk material; (e) only subsequently incorporating the solution of the functional

material and the fluid into the bulk material to form a single phase solution from the functional material, the bulk material and said fluid, and (f) removing said fluid from said solution in order to leave the combined functional and bulk materials, thereby resulting in a material having the function of the functional material.

As clearly described in amended claim 1, the presently claimed subject matter is a “**method**,” where not only the processing steps themselves are important, but also the order of conducting these steps is likewise important. The claimed method comprises the steps of (a) to (f) **in the order of, first** providing a first material, **the first material being a functional material able to alter the function of a second material** and providing a fluid which is near or in the supercritical fluid state, then at least partially **dissolving** the first material in the fluid which is provided near or in the supercritical fluid state, then providing a second material, the **second material being a bulk material and then, incorporating** the solution of the functional material and the fluid into the bulk material to form a single phase solution from those three components. In other words, in the present claims, the step (c) for dissolving the first material in the near supercritical or supercritical fluid occurs first, and then the step (e) for incorporating the resulting solution into the second material follows. **This particular order is already an important limitation in the presently claimed method.**

Further, claim 1 has been amended to make it explicit that the first material is a “functional material” and that the second material is a “bulk material”. In the Office Action, the Examiner states that “designation of materials being mixed as “bulk” and “functional” are arbitrary”. However, this should not be arbitrary. The present application deals with the specific problem of incorporating a functional material (i.e. a material that

has the ability to perform a specific function or number of functions) into a bulk material (i.e. a material to have its properties altered by inclusion of the functional material).

In contrast, Starke *et al.* relates to a process for mechanically mixing polymers and lower viscosity fluids. Starke *et al.* disclose a method for combining a first material (plasticizable polymer 13) and a second material (lower viscosity fluid 17), comprising the steps of: (a) providing a fluid which is in the supercritical fluid state (supercritical CO<sub>2</sub> may be used as a plasticizing agent), (b) mixing the first material (polymer 13) and the fluid (plasticizing agent 19), (c) only subsequently incorporating the mixture of the first material and the fluid into the second material (lower viscosity fluid; see column 9 lines 15 to 25) to form a fine and homogenous dispersion of the first material, the second material and the fluid.

This is a specific method that bears no relation to the presently claimed method for combining a functional material with a bulk material in order to impart the function of the functional material onto the bulk material. There are several features of claim 1 that are not disclosed in Starke. By way of explanation, given the claimed order of steps in the presently claimed method, only the plasticizable polymer (13) of Starke *et al.* can be considered the first material of the present claims, and only the low viscosity fluid (spin agent 17) can be considered the second material. The following features of presently pending claim 1 are therefore not disclosed in Starke:

- The first material being a functional material able to alter the function of the second material (the plasticizable polymer (13) does not alter the function of the spin agent (17)).
- At least partially **dissolving** the first material (polymer 13) in the fluid (plasticizing

agent 19), Starke *et al.* only disclose ***mixing*** the polymer and supercritical CO<sub>2</sub>, since the supercritical CO<sub>2</sub> acts as a plasticizing agent.

- Forming a single phase solution from the first material, the second material and the fluid. Starke *et al.* only disclose forming a homogenous mixture generally.
- Removing the fluid from this solution.
- The result being a material having the function of the functional material.

Prince *et al.* do not cure the deficiencies of Starke *et al.* Prince *et al.* relate to a spray application of plastic additives to polymeric materials. Prince *et al.* disclose a method for combining a first material (polymer additive material) and a second material (liquid carrier material), comprising the steps of providing a fluid which is near or in the supercritical fluid state (viscosity reducing material such as supercritical fluid (see column 5 lines 3 to 5)), forming a solution from the first material, the second material and said fluid (see column 7, lines 59 to 65), and removing said fluid from said solution in order to leave the combined first and second materials (column 6, lines 12 to 14).

Prince *et al.* do not teach forming a single phase solution from the first material, the second material and the fluid. The supercritical fluid of the Prince *et al.* reference is used only to reduce the viscosity of a slurry of the first material and the second material. In addition, the Prince *et al.* reference does not teach the order of the steps of the method. Prince *et al.* teach mixing a first material and a second material in order to form a slurry, which is ***subsequently*** mixed with the supercritical fluid (See column 7, lines 56-65 and column 8, lines 3-8). The Examiner points to column 9, lines 5-10 to support the rejection of the limitations of previous claim 2, more specifically, the partial dissolution of the first material in the fluid prior to the dissolution of the second in the

fluid. However, this portion of the Prince *et al.* reference actually only discloses a mixture of slurries (combinations of the first and second materials). The Prince *et al.* reference does not in any way disclose or contemplate at least partially dissolving the first material in the fluid which is already near or in the supercritical fluid state to form a first solution *prior to* combining the first solution with the second material.

Hoy *et al.* also do not cure the deficiencies of Starke *et al.* or Prince *et al.* This document relates to liquid spray application of coatings using supercritical fluids as diluents. The Hoy *et al.* reference is similar to the Prince *et al.* reference as it discloses using supercritical carbon dioxide as a viscosity lowering agent in the formation of a spray. Hoy *et al.* disclose that the majority of the carbon dioxide vaporizes so that the composition formed is substantially made up of the original viscous coating formulation (see column 8, lines 58 to 60).

The Examiner concludes that Prince *et al.* and Hoy *et al.* disclose removal of supercritical CO<sub>2</sub> from mixtures, and thus it is obvious to remove supercritical CO<sub>2</sub> in the method disclosed in Starke *et al.* However, Applicants submit that this rejection impermissibly relies on hindsight, and this conclusion can only be reached by knowledge of the presently pending application.

As indicated above, the Starke *et al.* reference relates to a method for mechanically mixing a polymer with a lower viscosity fluid. Supercritical fluid is mixed with the polymer during the process to act as a plasticizing agent. There is no suggestion in Starke *et al.* that supercritical fluid should, or even could, be removed after mixing the polymer and the plasticizing agent with the low viscosity fluid.

Prince *et al.* and Hoy *et al.* both relate to production of liquid sprays. In both

Prince *et al.* and Hoy *et al.* a supercritical fluid is used for the specific purpose of reducing the viscosity of the liquid. This function is completely different from the function of the supercritical CO<sub>2</sub> in the method of Starke *et al.* Accordingly, there is no reason why one of ordinary skill in the art would make any connection between the publications of Starke *et al.* and Prince *et al.* or Hoy *et al.*, and so these publications would not be combined. Furthermore, even if the skilled person were aware of all three of these publications, there is nothing in the teachings of Prince *et al.* and Hoy *et al.* that would suggest that supercritical CO<sub>2</sub> used as a plasticizing agent could or should be removed during the method disclosed in Starke *et al.*

It is also to be noted that, as indicated above, the present application relates to the specific problems associated with incorporating a functional material into a bulk material. In view of the completely different purposes of the methods disclosed in Starke *et al.*, Prince *et al.* and Hoy *et al.*, the skilled person would not seek to take advantage of any of the method steps disclosed in these documents, either alone or in combination, in order to arrive at the specifically claimed method of the present application. Any other conclusion can only be reached with the use of hindsight reconstruction. It is submitted that claim 1 of the present application is thus not obvious over the references of record.

With regard to claims 4 and 18, Starke *et al.* do not disclose that the second material (which, for the reasons indicated above, can only be the low viscosity fluid or spin agent 17) is in a semi-solid or molten state. The passage to which the Examiner refers relates to the polymer being injected as a "melt". Therefore, if one could interpret Starke *et al.* to teach that polymer is incorporated as a melt, the ingredient that is



incorporated as a semi-solid or melt would be the first material of Starke *et al.*, not the second material as required by the presently pending claims. Accordingly, Starke *et al.* cannot possibly be relied on to teach the specific order of the process steps of the presently pending claims as Starke *et al.*, assuming arguendo, teaches the first material, ***not the second material***, is incorporated as a melt.

Further, the Examiner repeats his assertion that Prince *et al.* discloses the subject matter of claim 4 because it discloses “slurries” of additives. The Examiner does not, however, explain why he believes a “slurry” (i.e. a suspension of solid in liquid) could be considered to be relevant to claim 4. As previously explained, a “slurry” is neither “semi-solid” nor “molten”. Accordingly, Prince *et al.* do not teach that the second material is provided as a semi-solid or melt, as required by presently pending claims 4 and 18.

With regard to claims 7 and 8, Claim 8 relates to processing the final solution (i.e. after removal of the fluid) to produce a final product. A minor amendment to claim 8 has been made to clarify this point. In view of the amendment to claim 8, any processing of a carbon dioxide-containing mixture that may be disclosed in Starke *et al.* is irrelevant.

The Examiner maintains the opinion that the liquid of Prince *et al.* is processed in order to produce a final product. Applicants respectfully disagree with the Examiner on this point. The liquid is sprayed onto a separate substrate to form a final product. The final product is not formed from the milling of the liquid itself as Prince *et al.* teach.

With regard to claims 9, 19 and 20, the Examiner appears to consider Starke *et al.* relevant to claim 9 because the word “extrusion” appears. However, Starke *et al.* only disclose extrusion in the context of processing the initial plasticizable polymer (13)

*prior to* addition of any supercritical CO<sub>2</sub> or any other material. Therefore, Starke *et al.* do not teach that the complete mixture is processed by extrusion or injection moulding to produce a final product as presently pending claim 9 requires.

The Examiner refers to column 18 lines 47 of Prince *et al.* The word “extruder” appears at this point in the reference. However, this passage relates to testing of samples, *not* the processing of the solution obtained by the method of claim 1 in order to produce a final product.

With regard to claims 10 through 15, The Examiner makes only a vague and unsubstantiated comment regarding relevance of Starke *et al.* to claims 10 to 15. The Examiner notes that Prince *et al.* refers to “functional fluids” in column 4 at lines 52 to 53. However, this section of Prince *et al.* relates to the second material. In contrast, the presently pending claims explicitly recite the first material as a functional material. This distinction is important due to the order of the steps as set out in claim 1.

Accordingly, the Starke *et al.*, Prince *et al.* and Hoy *et al.* references, taken alone or in combination, do not show all of the elements of the presently pending claims, and thus cannot render these claims obvious. In addition, none of the references provide any suggestion or motivation to change the order of the method steps of Starke *et al.* to arrive at the method of the presently pending claims, and thus cannot render these claims obvious.

Applicants respectfully request the Examiner to reconsider and withdraw the current rejection to presently pending claims 1, 4, 7-15 and 17-22.

**II. At page 5 of the Official Action, claims 5 and 6 have been rejected under 35 U.S.C. §102(b) as being unpatentable over Starke *et al.* (U.S. Patent No. 5,816,700) in view of Prince *et al.* (U.S. Patent No. 5,308,648) and Hoy *et al.* (U.S. Patent No. 5,108,799) in further view of DeSimone (U.S. Patent No. 5,922,833)**

The Official Action states that claims 5 and 6 are rejected under 35 U.S.C. §103(a) as being unpatentable over Starke *et al.* in view of Prince *et al.* and Hoy *et al.* as applied to claims 1, 4, 7-15 and 17-22, further in view of DeSimone (U.S. Patent No. 5,922,833).

As the basis for this rejection, the Official Action states in relevant part:

Claims 5 and 6 further differ in requiring that the carbon dioxide being removed by the material by venting or suction, although Prince *et al.* does disclose the fluid being volatile so as to separate from the material formed by mixing. DeSimone teaches to remove carbon dioxide from formed polymeric materials by venting and suction process steps (Column 5, lines 47-54, column 9, lines 44-49 and column 10, lines 18-23). It would have been obvious to one of ordinary skill in the art to have utilized the suction and venting of DeSimone in the process, to more thoroughly remove all of the supercritical fluids to form a more purified end product.

Applicant respectfully traverses this rejection of claims 5 and 6. The cited references do not establish a *prima facie* case of obviousness against the presently pending claims.

A brief outline of relevant authority is set forth above in Section I, the arguments of which are hereby incorporated by reference in their entirety.

Claims 5 and 6 each directly depend on claim 1 (recited above) and add the limitation of removing the fluid from the solution either by reducing the pressure and venting the fluid to the atmosphere as a gas (Claim 5), or by suction (Claim 6).

As described above in Section I, the arguments of which are incorporated herein by reference in their entirety, Starke *et al.* relates to a method for mechanically mixing a polymer with a lower viscosity fluid. Supercritical fluid is mixed with the polymer during the process to act as a plasticizing agent. There is no suggestion in Starke *et al.* that supercritical fluid should, or even could, be removed after mixing the polymer and the plasticizing agent with the low viscosity fluid.

Prince *et al.* relates to a method of suspending or dispersing a polymer additive material (first material) in a liquid carrier material (second material) to form a mixture having a paste-like consistency. Further, a viscosity reducing agent (the supercritical fluid) is subsequently added to form a sprayable composition. Prince *et al.* fail to teach a method for combining a first material and second material comprising the steps of providing a fluid which is near or in the supercritical fluid state first, and only then at least partially dissolving the first material in the fluid, and further incorporating the solution of the first material and the fluid into the second material to form a single phase solution, and removing said fluid from said solution. Further, Prince *et al.* fail to teach a single phase solution of the first material, second material and the fluid. Still further, Prince *et al.* fail to show that the supercritical fluid is removed from the composition through venting or suction. Therefore, Prince *et al.* fail to cure the deficiencies of Starke *et al.*

Hoy *et al.* disclose a liquid spray application of coatings using supercritical fluids as diluents. Hoy *et al.* is similar to Prince *et al.* as Hoy *et al.* disclose using supercritical

carbon dioxide as a viscosity lowering agent in the formation of a spray. Hoy *et al.* disclose that the majority of the carbon dioxide vaporizes so that the composition formed is substantially made up of the original viscous coating formulation (see column 8 lines 58 to 60). Therefore, Hoy *et al.* fail to cure the deficiencies of Starke *et al.*

The DeSimone reference discloses a process for making a fluoropolymer wherein the fluoromonomer is solubilized in a solvent in a supercritical state and then polymerizing the fluoromonomer to form a fluoropolymer. When the polymerization is complete, the supercritical solvent is separated off the composition through venting to the atmosphere.

The presently pending claims are distinguishable from the cited references. None of the references, taken alone or in combination, contains all the elements of the presently pending claims, and thus cannot render these claims obvious. In particular, independent claim 1 recites a method for combining a first material and a second material, comprising the steps of: (a) providing a first material, the first material being a functional material able to alter the function of a second material; (b) providing a fluid which is near or in the supercritical fluid state, (c) at least partially dissolving the functional material in the fluid, (d) providing a second material, the second material being a bulk material; (e) only subsequently incorporating the solution of the functional material and the fluid into the bulk material to form a single phase solution from the functional material, the bulk material and said fluid, and (f) removing said fluid from said

solution in order to leave the combined functional and bulk materials, thereby resulting in a material having the function of the functional material.

In contrast, Starke *et al.*, Prince *et al.*, Hoy *et al.*, and DeSimone all teach the use of supercritical fluids in combination with two or more materials. As discussed above in Section 1, the arguments of which are incorporated by reference herein in their entirety, Starke *et al.* fail to teach the same order for the method steps. In particular, Starke *et al.* do not teach the first material being a functional material able to alter the function of the second material. Starke only discloses ***mixing*** the polymer and supercritical CO<sub>2</sub>, since the supercritical CO<sub>2</sub> acts as a plasticizing agent and therefore does not teach at least partially ***dissolving*** the first material (polymer 19) in the fluid, as required by presently pending claim 1. Starke *et al.* disclose forming a homogenous mixture, but do not disclose forming a single phase solution from the first material, the second material and the fluid. Starke *et al.* do not disclose removing the fluid from this solution. Starke *et al.* do not disclose the result being a material having the function of the functional material. There is nothing in the Starke *et al.* reference to suggest or motivate one of ordinary skill in the art to carry out the method steps in a different order, such as is presently claimed.

Furthermore, the fluid near or in the supercritical fluid state of the presently pending claims is used as a solvent to aid dissolving the first material in the second material. In contrast, the supercritical fluid of the Starke *et al.* reference is used as a plasticizing agent, which is a completely different function from what is claimed in the presently pending claims. In view of this different function, it would ***not*** be within the

contemplation of one of ordinary skill in the art to depart from the teachings of Starke *et al.* to arrive at the subject matter of the presently pending claims.

Prince *et al.* do not remedy the deficiencies of Starke *et al.* Prince *et al.* do not teach forming a single phase solution from the first material, the second material and the fluid. The supercritical fluid of the Prince *et al.* reference is used only to reduce the viscosity of a slurry of the first material and the second material. In addition, the Prince *et al.* reference does not teach the order of the steps of the method recited in presently pending claim 1. Prince *et al.* teach mixing a first material and a second material in order to form a slurry, which is **subsequently** mixed with the supercritical fluid (See column 7, lines 56-65 and column 8, lines 3-8). The Examiner points to column 9, lines 5-10 to support the rejection of the limitations of previous claim 2, more specifically, the partial dissolution of the first material in the fluid prior to the dissolution of the second in the fluid. However, this portion of the reference actually only discloses a mixture of slurries (combinations of the first and second materials). The reference does not in any way disclose or contemplate at least partially dissolving the first material in the fluid which is already near or in the supercritical fluid state to form a first solution *prior to* combining the first solution with the second material.

Hoy *et al.* also do not cure the deficiencies of Starke *et al.* or Prince *et al.* This document relates to liquid spray application of coatings using supercritical fluids as diluents. Hoy *et al.* is similar to Prince as it discloses using supercritical carbon dioxide as a viscosity lowering agent in the formation of a spray. Hoy *et al.* disclose that the majority of the carbon dioxide vaporizes so that the composition formed is substantially

made up of the original viscous coating formulation (see column 8, lines 58 to 60).

According to the Examiner, the DeSimone reference is cited only to show that a supercritical fluid can be removed from a solution through venting. In this regard, Applicants note that the DeSimone reference discloses a process for making a fluoropolymer wherein the fluoromonomer is solubilized in a solvent in a supercritical state and then polymerizing the fluoromonomer to form a fluoropolymer. When the polymerization is complete, the supercritical solvent is separated off the composition through venting to the atmosphere.

However, DeSimone does not teach or suggest a method for combining a first material and a second material comprising incorporating a solution of the first material and a near supercritical or supercritical state fluid into the second material to form a single phase solution from the first material, second material and said fluid, as recited in the process steps of presently pending claim 1. DeSimone provides ***no guidance*** to modify the order of the method steps as disclosed in Starke *et al.* to arrive at the method of present claim 1.

Further, the Examiner maintains that the DeSimone reference teaches that the supercritical fluid can be removed from a solution through suction. If the Examiner continues to maintain this point, Applicants respectfully request that the Examiner further point out where the DeSimone references discloses such a process step.

Accordingly, none of the references, taken alone or in combination, teach a method for combining a first material and a second material, comprising the steps of: (a) providing a first material, the first material being a functional material able to alter the



function of a second material; (b) providing a fluid which is near or in the supercritical fluid state, (c) at least partially dissolving the functional material in the fluid, (d) providing a second material, the second material being a bulk material; (e) only subsequently incorporating the solution of the functional material and the fluid into the bulk material to form a single phase solution from the functional material, the bulk material and said fluid, and (f) removing said fluid from said solution in order to leave the combined functional and bulk materials, thereby resulting in a material having the function of the functional material.

Accordingly, the Starke *et al.*, Prince *et al.*, Hoy *et al.* and DeSimone references, taken alone or in combination, do not show all of the elements of the presently pending claims, and thus cannot render these claims obvious. In addition, none of these references provides any suggestion or motivation to change the order of the method steps of Starke *et al.* to arrive at the method of the presently pending claims, and thus cannot render these claims obvious.

Applicants respectfully request the Examiner to reconsider and withdraw the current rejection to presently pending claims 5 and 6.

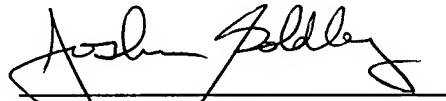
**CONCLUSION**

In view of the foregoing, Applicants submit that the application is in condition for immediate allowance. Early notice to that effect is earnestly solicited. The Examiner is invited to contact the undersigned attorney if it is believed that such contact will expedite the prosecution of the application.

In the event this paper is not timely filed, Applicants petition for an appropriate extension of time. Please charge any fee deficiency or credit any overpayment to Deposit Account No. 14-0112.

Respectfully submitted,

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A handwritten signature in black ink, appearing to read "Gary M. Nath", is written over a horizontal line.

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